Performance-Based Communications

Challenges and Opportunities

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Navigation, and Surveillance (ICNS)
Conference

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**Federal Aviation
Administration**

Overview

- **Current situation**

- **Standards**

- **An RCP demonstration**

Introduction
2007 air traffic data link services

North Atlantic Region benefits from data link
- In 2004, traffic levels exceeded pre–2001 levels
- NAV CANADA has reduced communication costs to users by 50%
- 55% of the fleet use either FMC WPR or FANS 1/A ADS–C for automatic position reporting

Europe plans mandate for continental data link services (2009-2014)
- Partial CPDLC application
- ATN services and aircraft equipage compulsory
- Accommodation of FANS 1/A aircraft voluntary
- FANS 1/A aircraft exempt from ATN aircraft equipage

Globally harmonized data link services for existing fleet (2015)
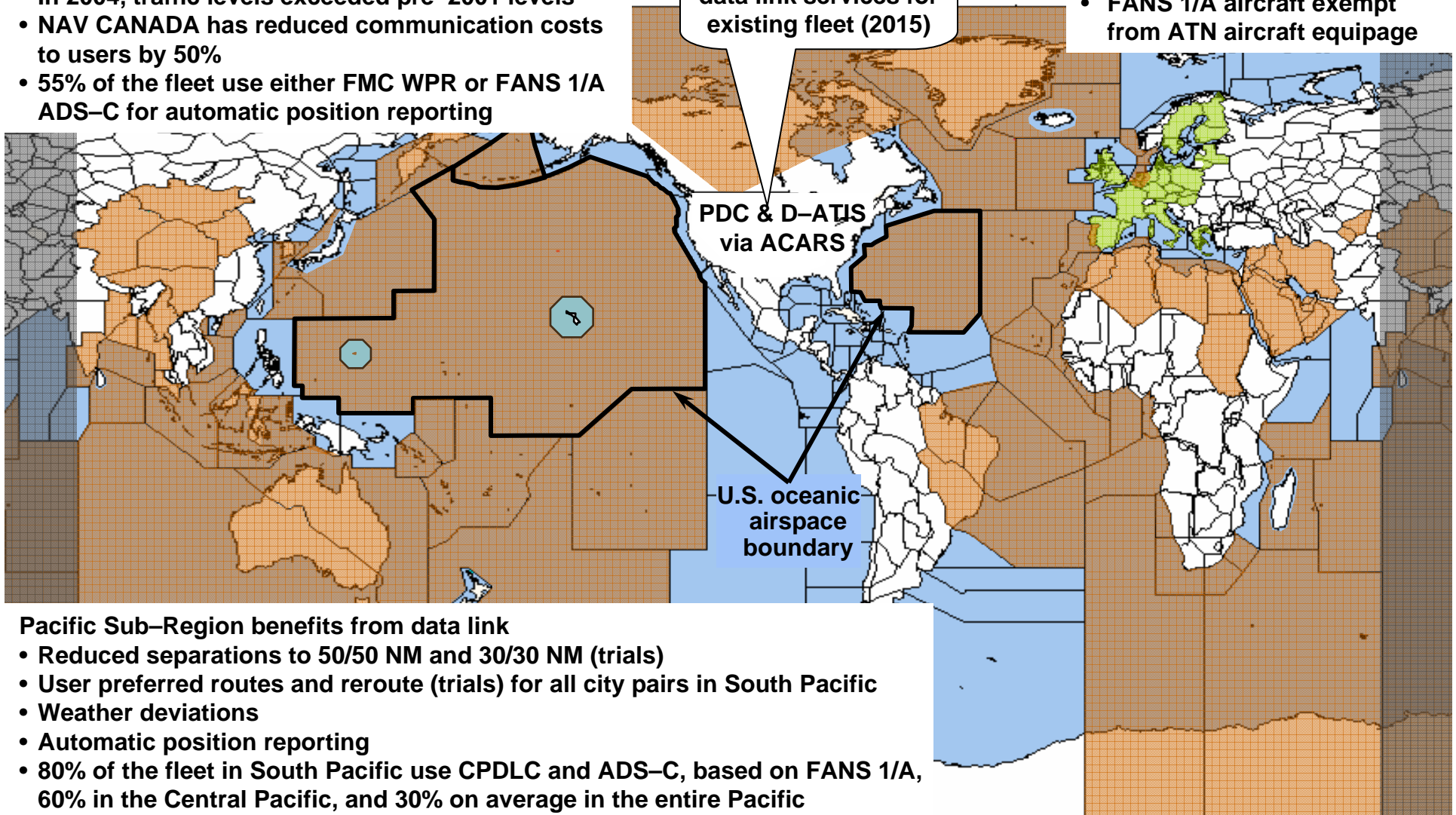
PDC & D–ATIS via ACARS

U.S. oceanic airspace boundary

Pacific Sub–Region benefits from data link
- Reduced separations to 50/50 NM and 30/30 NM (trials)
- User preferred routes and reroute (trials) for all city pairs in South Pacific
- Weather deviations
- Automatic position reporting
- 80% of the fleet in South Pacific use CPDLC and ADS–C, based on FANS 1/A, 60% in the Central Pacific, and 30% on average in the entire Pacific

March 13 FAA decision - oceanic

- Modify the 30/30 ops concept for the current operational trial in OC3 to restrict the application of 30/30 separation to in-trail climb and descent operations involving approved pairs of aircraft

- Given the modified ops concept, the operational trial was expanded to all of ZOA on 13 March 2007

- The use of 50 longitudinal separation was also restricted to in-trail climb and descent operations involving approved pairs of aircraft

- Owing to the current reliability of the data link system, the 30/30 and 50 long separation minima will be restricted as described above until there is "sufficient" evidence of "acceptable" operational data link system performance

Areas of concern

- Lost messages

- Communication outages

- Deviations, due weather and even without requesting clearances

- OCEAN21 not working as needed, e.g., LDC in Wx Dev

- Aircraft avionics, unknown, upgrades, e.g., LDC at offset execution

- Operational and procedural training, flight crews and controllers

- Message transit times exceeding target, CSP performance

- **No validated communication performance-based criteria**

Areas of concern

- **Fluctuations in performance levels for commercial satellite services**

  – What are the performance criteria, what needs to be monitored, and what is the decision process

  – What about predicted performance?

  – Backups and redundancy

  – Dissimilarity, e.g., Iridium, HF data link, INMARSAT, data/voice

ICAO – Standards for air traffic data link services

- **ICAO completed standards and guidance material for RCP, effective Nov 07**

    – Provisions for RCP in Annex 6 and Annex 11

    – Manual on RCP → ICAO Doc 9869

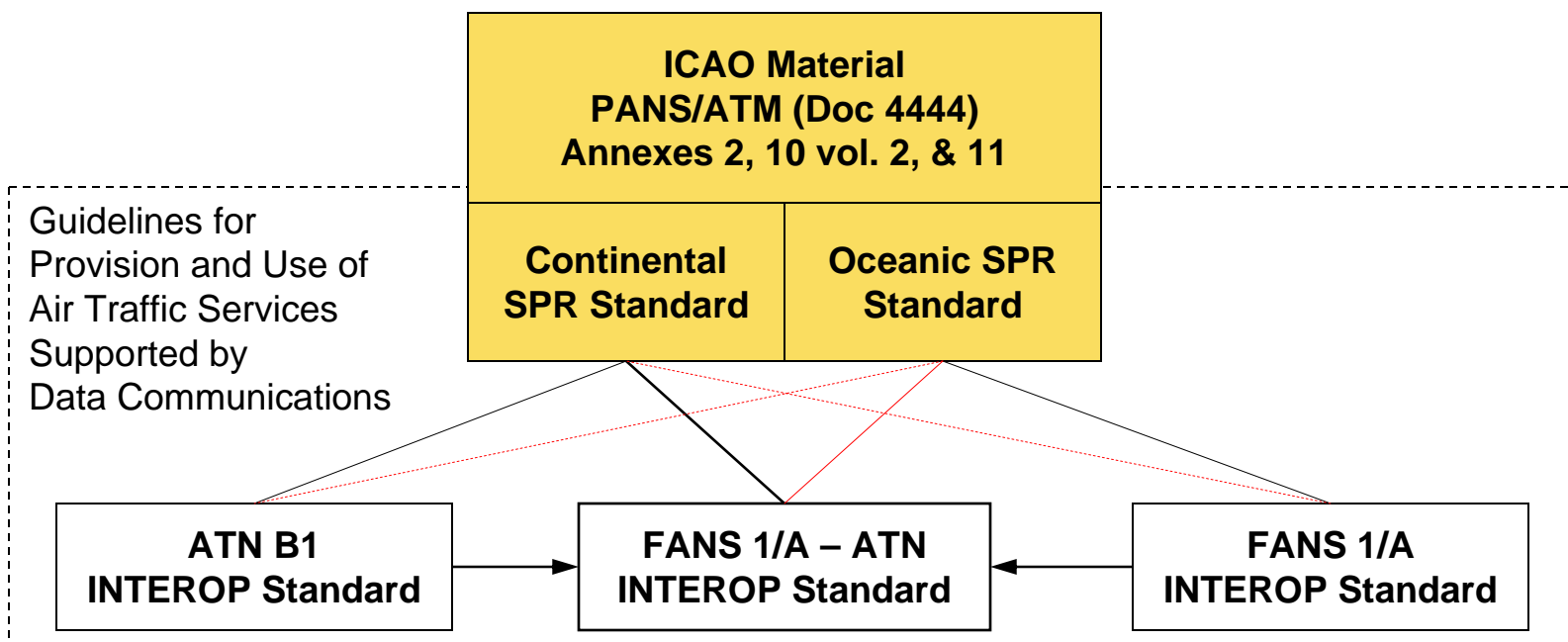# RTCA/EUROCAE – Standards for air traffic data link services

SC-189/WG-53 Work Items	Final Review	Publish
New document – Oceanic Safety and Performance Standard	Completed <10 Issues	26 Jun 2007
RTCA DO-290/EUROCAE ED-120, Chg 2 Continental Safety & Performance Standard	Completed 1 Issue	26 Jun 2007
New document - FANS 1/A – ATN Mixed Technology Interoperability Standard	Completed 1 Issue	26 Jun 2007
RTCA DO-280B/EUROCAE ED-110B ATN B1 Interoperability Standard	Completed 1 Issue	26 Jun 2007
RTCA DO-258A/EUROCAE ED-100A FANS 1/A Interoperability Standard	N/A	Apr 2005

Overview of standards

ICAO Material
PANS/ATM (Doc 4444)
Annexes 2, 10 vol. 2, & 11

Guidelines for Provision and Use of Air Traffic Services Supported by Data Communications

| Continental SPR Standard | Oceanic SPR Standard |

ATN B1 INTEROP Standard → FANS 1/A – ATN INTEROP Standard ← FANS 1/A INTEROP Standard

Based on ICAO Material/SPR standards and existing INTEROP standards

"Mixed Technology" Environments			
Airspace Type	**Technology**		**Remarks**
	Ground System	**Aircraft System**	
Continental	ATN B1	FANS 1/A	Initial Release
Oceanic	FANS 1/A	ATN B1	**Not considered**

Harmonize data link services

- **Planning & Implementation Regional Groups**

  – North Atlantic Systems Planning Group (NAT SPG)

  – European Air Navigation Planning Group (EANPG)

Data Link Steering Group (DLSG) and ATN Accommodation Drafting Group (ADG)

Harmonize data link services

Operational Requirements

Standards for ADS-C & CPDLC

RTCA/EUROCAE FANS 1/A - ATN Interoperability Standard

Data link harmonization strategy (1 or 2)

- **Any additional ADS-C or CPDLC implementation either**

  - Uses without change the existing FANS 1/A (DO-258A/ED-100A, full CPDLC and ADS-C), and ATN B1 (DO-280B/ED-110B, partial CPDLC for ACM, ACL, and AMC), or

  - Moves to the full implementation of an internationally agreed common technical definition

    - Based on ICAO Doc 4444 (PANS-ATM) and other operational material, as appropriate

    - A common technical definition (e.g., Manual on technical provisions for the aeronautical telecommunication network (ATN) (ICAO Doc 9880, First edition)

    - Proposal from ADG on ADS-C available for further coordination through marked-up ICAO Doc 9694

# Data link harmonization strategy (2 of 2)

- **Stop partial CPDLC or ADS-C evolutions, as they will promote divergent paths to the detriment of the broader community**

- **Common procedures for implementation are essential**

  - Regional and other implementation groups harmonize and adopt common procedural guidance packages

  - Rather than each region developing and promulgating unique procedures for common functions

Performance-based operations

- **Balances capability & performance of**
  - Communications, e.g., DCPC
  - Navigation, e.g., RNAV/RNP
  - Surveillance, e.g., ADS-C, ADS-B
  - Air Traffic Management
    e.g., route conformance monitoring
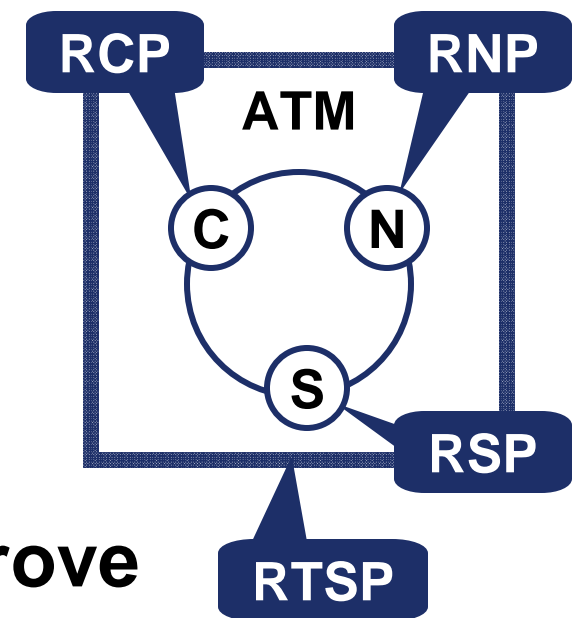
- **Builds on what we have to improve**

RCP — RNP

ATM

C — N

S

RSP

RTSP

Performance-based communications

- **RCP type specifies communication transaction time, continuity, availability, integrity**

- **Other operational factors may be relevant, for example**

  – Messages or phraseology, transaction types, and intended use

  – Interactive capability of voice communication

  – Air–ground integration capability of data communication

  – Performance monitoring and alerting

  – Adapting the airspace to changes in performance level

Objectives and benefits

- Promotes a competitive market for aeronautical communication services enabling cost–effective alternatives that meet business needs in a more timely manner

- Provides means to demonstrate communication performance using a variety of acceptable methods in lieu of time consuming data collection and empirical analyses

- Defines "needed" operations based on communication performance levels that are not yet obtainable with current technology

- Enables varying service levels in common airspace to a fleet of aircraft with varying communication capabilities and performances

What it does

- **Establishes operational criteria**

  - Determines capability and performance criteria based on intended operations in oceanic, en route, terminal, and airport domains

  - Considers voice and data communications

  - Considers global seamless operations

  - Specifies RCP type and other relevant operational factors

  - Not based on any particular technology

How it is used

- **Performance-based criteria is used to**
    - Determine viability of a particular technology
    - Qualify, certify, and approve various parts of an implementation
    - Manage performance levels needed to provide a basic level of service and, for eligible operators, higher levels of service
        - Real time monitoring and alerting (air and ground)
        - Historical monitoring and evaluation
        - Adapting the airspace based on the results of monitoring

Applicability

- **When a change is implemented in air traffic management (ATM) and/or flight operations**

- **And the change is predicated on communication performance**

- **Safety management and monitoring**

Legacy remains valid

Candidates for implementation

- Reduced separation minima, new procedures, or increasing airspace capacity that requires a communication capability and performance

- Operating in airspace with a basic level of service and, for eligible operators, with higher levels of service

- Provision and use of air traffic service using non-traditional technology or mixed technologies

- Communication capability installed on aircraft whose performance is suitable for use in some airspace, but not in others

And here we conduct our flight
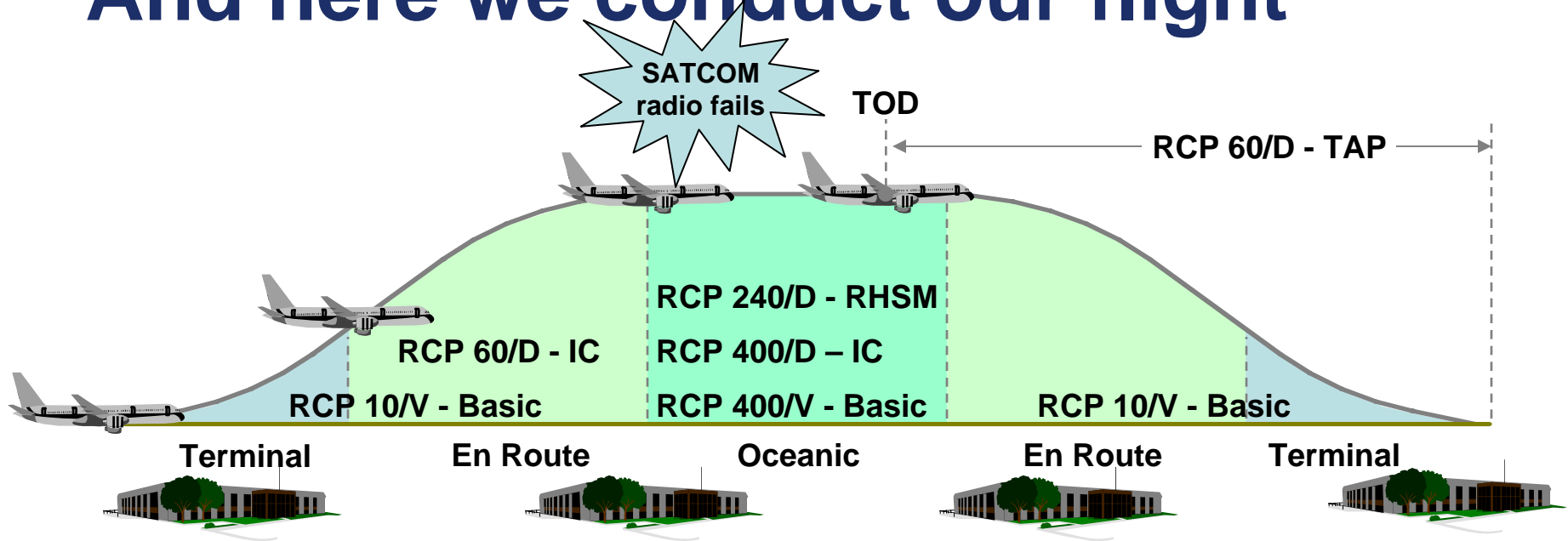
1. RCP types for service level(s) published in AIPs and charts
2. Ground side monitors communication service
3. Eligible Operators file for service level(s)
4. Air side monitors aircraft system
5. Pilot/controller know RCP type, just as they know RNAV/RNP type
6. Pilot/controller operates according to RCP type
7. Pilot/controller receives alerts for communication failures

Performance-based Communications
1-3 May 2007

/D - Data
/V - Voice
IC – Increased capacity
RHSM – Reduced horizontal separation minima
TAP – Tailored Arrival Procedure

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Conclusion

- **What does an RCP type mean for**

  - Aircraft certification

  - Operational authorizations

  - Continued safe operations, e.g., monitoring, adaptation

- **What is the impact of "degraded" communication performance**

  - At dispatch – minimum equipment/performance

  - During operations – failures, reporting, adaptation

- **How do you transition to performance-based communications, treatment of legacy communications**

- **How/when do you predict communication performance**

Thank you

Comments?

Questions?

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